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ABSTRACT

In the countries of the Asian region there is a long tradition of teaching and learning in large undivided halls. Articulation tests were carried out in schools in India, Sri Lanka, Malaysia, and Singapore to explore the acoustic environment of hall-type schools in which teaching groups were separated by storage or chalkboard partitions. This leaflet summarizes the study findings of factors that contribute to good hearing conditions in schools. They are siting school buildings away from sources of noise; separating noisy and quiet rooms in the school building; locating the furthest student no more than seven meters distant from the teacher; and building partitions between teacher stations at least two meters in height. (MLF)

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EDUCATIONAL BUILDING DIGEST 1

UNESCO REGIONAL OFFICE FOR EDUCATION IN ASIA, P.O.BOX 1425, BANGKOK

IMPROVING THE ACOUSTIC ENVIRONMENT IN OPEN HALL SCHOOLS

1. INTRODUCTION

There is, in the countries of the Asian region, a long tradition of teaching and learning in large undivided halls or ***salas***. The ***pirivena*** schools for Buddhist monks, the Hindu ***tols*** and ***pathsalas*** as well as the Muslim ***madrasahs*** and ***maktals*** are good examples of educational institutions in Asia that have always been housed in open halls.

It was somewhat natural, therefore, in more recent times as the desire for education grew and secular schools began to be established in the various countries of the region, for the traditional form of the open hall building to continue to be used to house the new educational institutions. That the tradition was continued in this way was, perhaps, not entirely due to a desire to preserve the old built form for its own sake, but also probably to the thermally comfortable environment provided by this type of building.

Conveniently also, the open hall school is substantially cheaper than a school divided up by walls into a series of separate class-rooms. For these reasons therefore, in parts of Bangladesh, Burma, India, Nepal, and Sri Lanka, schools, especially in rural areas, continue to be built in the form of long, undivided spaces in which the teaching groups are ranged, side by side, down the length of the hall.

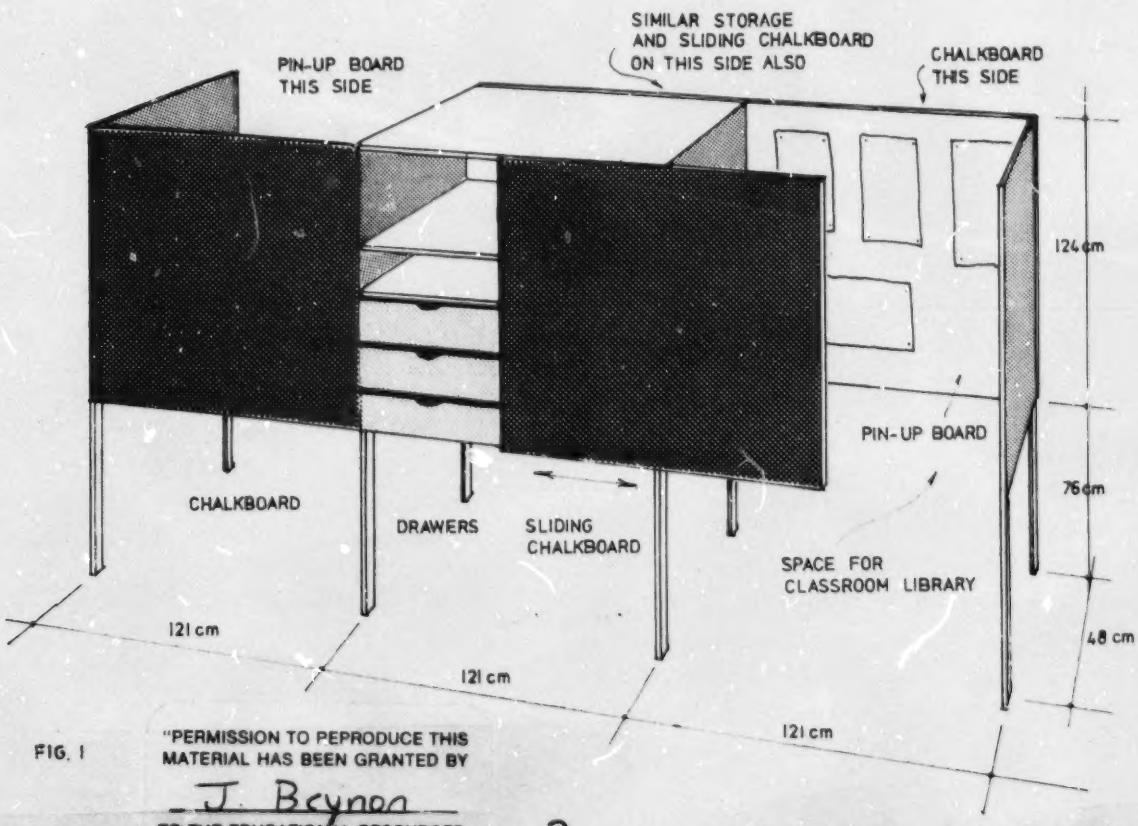

FIG. 1

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An evaluation of schools of this type shows, on the credit side, their total adaptability in respect of internal rearrangement coupled with the advantages of comfort in relation to climate. On the debit side, the absence of internal division walls (on which large areas of chalk and pin-up board can be fixed) means that each teaching group is usually provided with nothing more than a small chalkboard on an easel and only in rare instances is storage space provided for use by the teacher or pupils. Coupled with this are strong criticisms of the difficulties of teaching due to noise from adjoining groups.

The first difficulty, that of lack of facilities for visual aids and storage of other teaching material, is easily overcome in such a way that the advantages of flexibility and thermal comfort, inherent in the hall type school, are not lost. The easily moved storage unit shown in Figure 1 provides chalk and pin-up boards, lockable drawers and shelving and space for the class-room library. Many units of this type have now been installed in schools in Sri Lanka, whilst in India, the Central Building Research Institute, Roorkee, has designed similar units for use in Indian Schools.

There remains, thus, the criticism that open hall type schools provide an environment that is too noisy for effective teaching and learning.

The first reaction to this criticism is that it is from such schools that generations of distinguished Asians have emerged, apparently unaffected by the noisy environment of the schools in which they studied. Indeed, one eminent scholar claimed to have developed his love of literature by listening for a year to an outstanding teacher of the adjoining class, whilst his own teacher was teaching geography - - a choice of subjects and teachers that would not have been available to him in a more conventional class-room situation.

On the other hand, it is from these same rural hall type schools that children drop out in large numbers. If noise is one of the many factors likely to contribute to wastage, then it is very important that it be investigated.

It was against this background that physicists and architects of the Central Building Research Institute, Roorkee, India, under contract to the Unesco sponsored Asian Regional Institute for School Building Research, set out to explore the acoustic environment of hall type schools, in which teaching groups were separated by light storage or chalkboard partitions similar to those described above. Their conclusions are fully reported elsewhere[1] and summarized in this Digest.

2. NOISE IN THE TEACHING SPACE

A child listening in a teaching space commonly and simultaneously hears sound from four sources:

i) his own teacher's voice;

ii) background sound in his own teaching space (chairs scraping, sounds of movement from nearby children);

iii) intrusive sound from adjoining teaching spaces (teachers' voices, sounds of activity of children);

iv) external sound (vehicles, cattle, birds, people talking).

In almost any situation, both in and out of school, some background sounds can always be heard[2].

The important question, considered by those making the study of the acoustic environment in hall type schools, was whether the children were able to hear their own teacher's voice above the other background, intrusive and external sounds that could also be heard in the teaching space.

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1 Chaudhury, N.K.D., ***Sound diffraction around movable partitions in teaching spaces. Educational Building Report No 1.*** Bangkok, Unesco Regional Office for Education in Asia, 1973.

2 This will be realized if the reader pauses a moment, sits back and tries to identify all the sounds he or she can hear. Complete silence is a very rare phenomenon.

3. ARTICULATION

The answer to the question can be established quantitively using "articulation tests". These tests are worth very brief description as this will further clarify factors affecting good hearing conditions.

The test takes place in a normal teaching space and is given by the usual teacher to a group of his, or her, children seated around a measuring microphone. Recorded background sound is then played into the space at various intensity levels. The teacher, with a normal voice, dictates to the children and in their own language several sets of carefully chosen words having similar sounds such as in the English language[3], "pen, hen, men, ran....,". The number of errors made by the children in writing down the words they thought they heard are calculated as an "articulation index". The tests are repeated and each time the intensity of recorded background sound is increased.

By relating the articulation indices to the sounds actually heard by the children (background, intrusive and external sounds), it is possible to draw some conclusions about the acoustical environment in open hall type schools with light movable type partitions separating the teaching groups. The conclusions drawn from these tests and from other measurements and observations made during the study are summarized below.

4. FACTORS CONTRIBUTING TO GOOD HEARING CONDITIONS IN TEACHING SPACES

a) Siting of the school buildings.

Locate them as far as possible away from sources of noise (undesired sound), such as roads, railways, factories and the like. Sound levels vary inversely as the square of the distance from the source.. At about 5 metres from a source of sound the reduction in intensity will be of the order of 5 dbA. At 40 metres the reduction will be nearly 25 dbA.

b) Relationships of noisy and quiet rooms in the school building.

Music rooms and workshops should be located as far away from quieter spaces such as, libraries, class-rooms and laboratories as possible.

In two session schools, the playground where the second session children assemble and wait for children from the first session to finish work, should be sited as far away from the class-rooms as possible.

c) Within the teaching spaces.

i) no pupil should be more than 7 metres distant from the teacher (Figure 2);

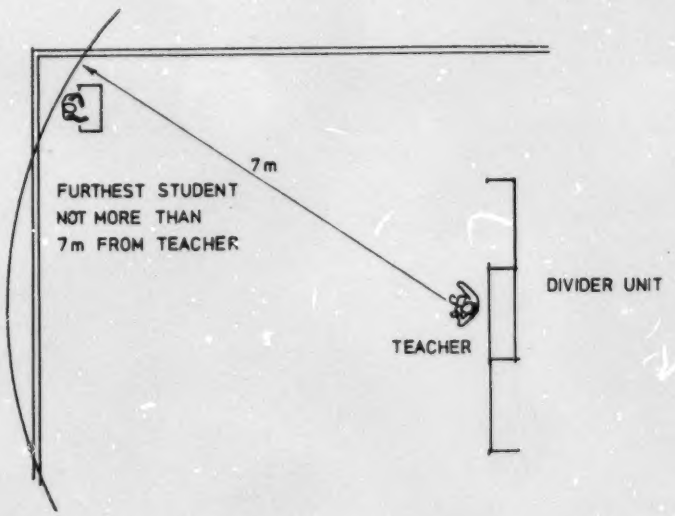

FIG. 2

[3] The tests were carried out in schools in India, Sri Lanka, Malaysia and Singapore using the following languages (depending on the country)--- Chinese, English, Hindi, Konkani, Malay, Malayalum, Sinhala & Tamil.

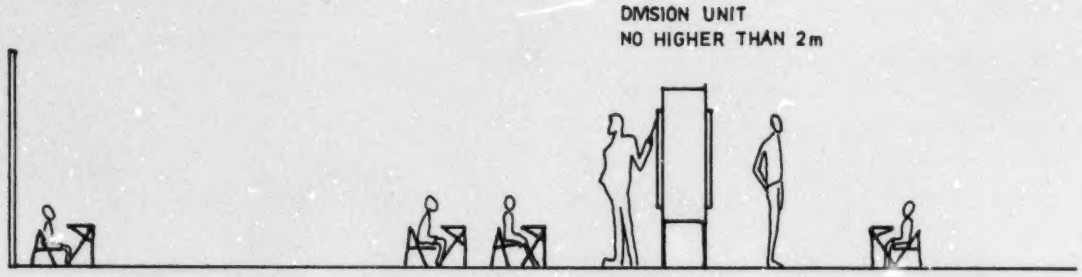

FIG. 3 TEACHERS "BACK TO BACK"

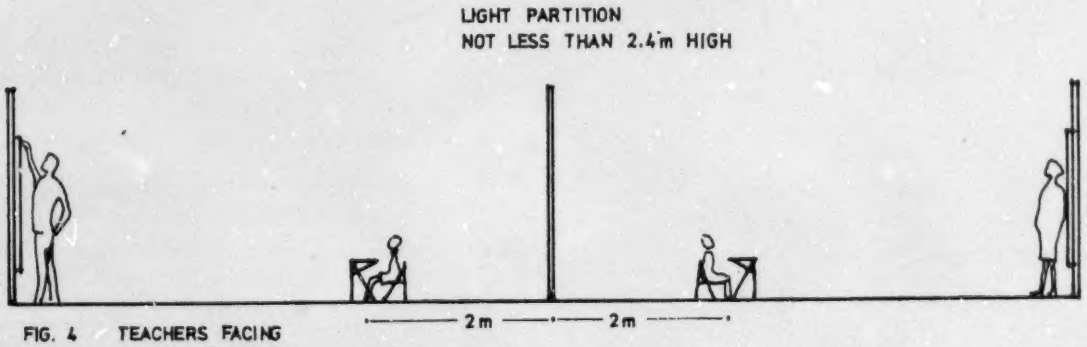

FIG. 4 TEACHERS FACING COMMON PARTITION

ii) where teachers in adjacent class-rooms are teaching "back to back" on either side of a partition, then the partition or division unit need be no higher than 2 metres in order to keep intrusive sound at a reasonable level. (Note : the maximum height for the top of a chalkboard is 1.87 metres). (Figure 3).

iii) where teachers are in adjacent class-rooms with chalkboards on walls facing the common partition then the partition should be not less than 2.4 metres high. Moreover, in such a situation the students in each class-room who are most distant from their teachers should be seated not closer than two metres from the partition. (Figure 4)

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